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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

FEE TRANSMITTAL for FY 2005

Effective 10/01/2004. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) $340.00

Complete if Known	
Application Number	09/529,957
Filing Date	April 21, 2000
First Named Inventor	Hertzman et al
Examiner Name	Vikkram Bali
Art Unit	2623
Attorney Docket No.	SPF 0004 PA/41105.14

METHOD OF PAYMENT *(check all that apply)*

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	790	2001	395	Utility filing fee	
1002	350	2002	175	Design filing fee	
1003	550	2003	275	Plant filing fee	
1004	790	2004	395	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) -0-

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below	Fee Paid
Total Claims		-20** =		X =
Independent Claims		- 3** =		X =
Multiple Dependent				=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	88	2201	44	Independent claims in excess of 3
1203	300	2203	150	Multiple dependent claim, if not paid
1204	88	2204	44	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) -0-

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	430	2252	215	Extension for reply within second month	
1253	980	2253	490	Extension for reply within third month	
1254	1,530	2254	765	Extension for reply within fourth month	
1255	2,080	2255	1,040	Extension for reply within fifth month	
1401	340	2401	170	Notice of Appeal	
1402	340	2402	170	Filing a brief in support of an appeal	340.00
1403	300	2403	150	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,370	2501	685	Utility issue fee (or reissue)	
1502	490	2502	245	Design issue fee	
1503	660	2503	330	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	790	2809	395	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR 1.129(b))	
1801	790	2801	395	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 340.00

SUBMITTED BY				(Complete *(if applicable)*)	
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Signature	Kristina Swanson			*Date*	October 19, 2004

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application of

Applicants	: Michael Hertzman and Trot Lane Brown
Serial No.	: 09/529,957
Filed	: April 21, 2000
Title	: CONTACTLESS MEASURING OF POSITION AND ORIENTATION
Docket	: SPF 0004 PA/41105.14
Examiner	: Vikkram Bali
Art Unit	: 2623

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, PO Box 1450, Alexandria, Virginia 22313-1450, on October 19, 2004.

Kristina E. Swanson — Reg. No. 53,657

Sir:

BRIEF ON APPEAL

This is an appeal from the Office Action mailed May 25, 2004, finally rejecting claims 1-21. A Notice of Appeal was timely filed on August 19, 2004, with the accompanying fee.

Real Party In Interest

The real party in interest is the assignee of this patent application, Sarpoh Sweden AB, by assignment from the named inventors, recorded in the files of the U.S. Patent and Trademark Office at Reel 014615, Frame 0133 on October 22, 2003.

Related Appeals and Interferences

Applicants know of no related appeals or interferences that would affect the outcome of the present appeal.

Status of Claims

Claims 1-21 are pending in the present application. Claims 1-21 stand finally rejected. Accordingly, claims 1-21 are before this Board on appeal. A correct copy of the appealed claims is found in the Appendix attached to this brief.

Status of Amendments

All of the amendments previously filed in this application have been entered. No amendments to the claims were filed subsequent to the final rejection.

Summary of the Invention:

Applicants' invention is a method and device for determining the position and orientation of a tool by imaging points on a predetermined area of the tool related to a measuring element even when those imaging points are obscured. A processor makes calculations based on image points on the tool that are imaged onto an imaging area. The processor calculates the momentary position and/or orientation along at least one axis of the tool making use of the image points. A number of measuring markers have predetermined mutual positions and are positioned along the tool. Each measuring marker comprises at least one measuring point. At least one of the points is identifiable. Each measuring marker to be used as position and/or orientation indicator has a size making it restorable by the processor even if a part of the marker is obscured from the image area, for example by dust or dirt on a construction site.

Issues Presented

The issues presented for review on appeal are:

(1) Did the Examiner err in rejecting claims 1-21 under 35 USC §103(a) as being unpatentable over Hayard?

To arrive at its conclusions, the Board must also address the following issues:

(2) Has the Examiner carried his burden of establishing a prima facie case by showing that the teachings of the references are properly combinable and that there existed in the prior art proper motivation and an expectation of success?

Grouping of Claims

The Examiner presented one ground of rejection for claims 1-21. Applicants will argue that ground of rejection using a representative claim. Claims 1-21 were rejected under §103(a) as being unpatentable over Hayard. Claims 1-21 are grouped for purposes of this appeal and stand or fall together. Claim 1 will be discussed as representative of this group.

The Reference:

Hayard, U.S. Patent No. 4,764,668 is directed to a system that uses a barcode scanner to detect the position and orientation of a surface of an object. At least four passive target patterns, one-dimensional barcodes, are positioned on the surface of the object. The barcodes are illustrated as typical UPC barcodes. Two of the barcodes are positioned along one axis and the

other two are along a second, orthogonal axis. The barcodes are spaced as far apart as possible from one another. The scanner reads the barcodes by scanning and determines the position of the object relative to the reference axes. The invention is particularly applicable to the docking and stowage maneuvers between space vehicles.

Summary of the Argument:

The Examiner has not carried his burden of establishing the necessary *prima facie* case of obviousness. The teachings of Hayard do not teach or suggest all of the claim limitations with respect to claim 1, nor with respect to the balance of the claims rejected over this combination.

Argument

I. Claims 1-21 are patentable over Hayard.

In order to establish a prima facie case of obviousness, the Examiner has the burden of showing, by reasoning or evidence, that: 1) there is some suggestion or motivation, either in the reference itself or in the knowledge available to one skilled in the art, to modify or combine the teachings of the references; 2) there is a reasonable expectation on the part of the skilled practitioner that the modification or combination will be successful; and 3) the prior art reference must teach or suggest all of the claim limitations. MPEP §2143. Both the teaching or suggestion to make the claimed combination or modification and the reasonable expectation of success must be found in the prior art and not based on an applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

In carrying this burden, the Examiner "must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious." *Ex parte Clapp*, 227 USPQ 972, 973 (PTOBPAI 1985). A rejection based on §103 clearly must rest on a factual basis, and these facts must be interpreted without hindsight reconstruction of the invention from the prior art. *In re Warner*, 154 USPQ 173, 178 (CCPA 1967). The Examiner may *not*, because he may doubt that the invention is patentable, resort to speculation, unfounded assumptions, or hindsight reconstruction to supply deficiencies in his required factual basis. *Id.*

In the final rejection, the Examiner rejected claims 1-21 under 35 USC §103(a) as unpatentable over Hayard. Claim 1 is representative. This rejection was based on the Examiner's incorrect and unsupported assertion that it would be obvious for one to "take the Hayard's disclosure for reorganization of the 3D mark and could create the 3D image of any obscured mark for the purpose of 3D creation." Apparently, the Examiner feels that it would be obvious to modify Hayard in some fashion to deal with "an obscured mark." Applicants controvert this rejection on several bases.

First, the Examiner has not shown that there is a suggestion or motivation in the Hayard disclosure to modify the teachings of Hayard. Hayard is "particularly applicable to space and satellites, and especially to manned flights. etc., in which rendezvous, docking , or stowage maneuvers are to take place" (Col. 2, lines 52-55), typically a fairly clean environment, at least to the extent that it can be said that outer space is free of mud and dirt. In contrast, the claimed invention is applicable to heavy earth-moving machinery working on construction sites, an inherently dirty, muddy and dusty environment. Since the Hayard system is intended for use in

space, there would be no motivation for the teachings of Hayard to be modified over concerns about its barcodes becoming obscured by mud or dirt.

Furthermore, the Examiner has not shown that there is a reasonable expectation on the part of the skilled practitioner that the modification will be successful. The basic structure of a barcode consists of a leading and trailing quiet zone, a start pattern, one or more data characters, optionally one or two check characters and a stop pattern. If one or all of the above elements is obscured, the barcode will not be read. Hayard discloses a barcode with both start and stop characters (Fig. 1, end marks 11 and 12) and a checksum character (Fig. 1, reference 18) which "is used as a check digit to verify that the other eleven code digits have been read properly" (Col. 3, lines 42-45). Further, Hayard discloses that the leading and trailing quiet zones "must be left blank" (Col. 3, lines 45-46; Fig. 1, reference 9). The Examiner asserts in the final rejection that "a barcode can be read as a obscured mark, because a barcode has bars that are not even, some are thin and some are thick." However, the Examiner fails to take into consideration that the barcode will not be read *at all* if any of the quiet zones, stop and start end marks, or the checksum character are not read properly because these marks have become obscured. It does not matter whether the individual bars of the barcode are thick or thin. Hayard suggests no way of dealing with this problem.

Hayard teaches that to find the relative position of an object by comparing the directions of two sets of reference axes, one fixed to the object and the other fixed relative to the sensor. The angle between these directions is calculated given the instants at which the barcodes on the surface of the object are *properly read* (Col. 4, lines 46-48). In addition, Hayard uses the

parameter of "the time which elapses between successive reads" (Col. 4, line 54). The determination of position and orientation is based on where and when a barcode was properly read in full by the scanner and the time elapsed between proper full reads (Col. 4, lines 55-68; Col. 5, lines 1-11). As demonstrated in Figs. 2, 3 and 4, the scanner scans the surface of the object, noting when a successful read of the barcode is made, which barcode is read, and the time between successful reads. It is from this information that the position and orientation of the object is calculated. If the barcodes are obscured so that the characters are not read, the characters will not be properly read in full and the calculations for position and orientation based on successive reads will be erroneous.

Further, Hayard teaches that in order to read the barcodes, it is necessary that the barcodes should be as long as the length of the bar codes at right angles to the bar direction and recommends that the bar codes be square (Col. 4, lines 17-22). Therefore, if the barcodes become obscured, the necessary configuration of the bar codes could be lost and the barcodes would not be read.

Finally, there is no suggestion or teaching in the reference that imaging points could be used in place of barcodes, nor is there any other reason evident in the reference which would lead to such a combination. Further, there is no other reason given in the reference which would lead to such a combination. In fact, Hayard teaches away from analyzing an image of the object by stating "it is much easier to read bar codes" (Col. 4, lines 14-16) than images.

In addition, Hayard specifically teaches that the bar codes should be "spaced as far apart as possible from one another on two perpendicular axes" (Col. 2, lines 61-64; Col. 4, lines 25-26)

in order to locate the axes, and therefore the orientation, of the object. This orientation is in contrast to the claimed invention which recites placing imaging markers along a line from one side of the tool to the other.

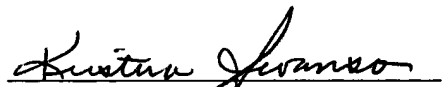
Accordingly, the obviousness rejection to claim 1 cannot stand, as the teachings of Hayard fail to suggest a motivation for the combination envisioned by the Examiner, fail to suggest that the modification of Hayard envisioned by the Examiner would function, and fail to suggest all of the claim limitations.

Conclusion

Accordingly, no prima facie case of obviousness has been established with respect to any of the claims on appeal. The Board is requested to reverse the rejections of claims 1-21 in their entirety.

Respectfully submitted,

DINSMORE & SHOHL LLP

By 
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APPENDIX
CLAIMS ON APPEAL

1. A method for contactless or touch-free measurements of a tool or accessories by means of at least one imaging area means and calculation indicating the position and/or orientation of the tool making use of image points on the imaging area means, based on the image points having predetermined mutual positions provided on the tool, imaged onto the imaging area means, and optics presenting the image points on the tool on the imaging area means, the image points being at least three visible within the field of view of the imaging area means at least one being distinctly identifiable, characterized by, in order to measure the position and/or orientation of the tool, providing a number of measuring elements on the tool, each measuring element having a size large enough for making a reconstruction of its form and calculation of at least one image point on the tool related to the measuring element even though a part of it happens to be obscured.

2. Method according to claim 1, characterized in that at least some of the measuring elements, called lined measuring elements, are positioned on at lease one row; and that for each row at least one 3D line going through the lined measuring elements for the row in question is determined.

3. Method according to claim 1, characterized in that consecutive measurements of the measuring elements are provided, each measurement resulting in calculation of the 3D position and/or 3D orientation of the tool, and further calculations are performed to calculate the 3D movements of the tool from calculation to calculation and thereby to calculate at least one type of movement of the tool, such as shift, or rotation.

4. Method according to claim 1, characterized in that most of the measuring elements are markers having the same shape, for instance circular, and that at least one of the markers has a

shape different from the others, clearly distinguishable in the imaging area means, each said differently shaped marker having a predetermined known position on the tool and determining a reference point for determining shift position, and that a point or points on each marker are calculated to be used as the measuring point or points representing the marker.

5. Method according to claim 4, characterized in that, said markers are arranged in plurality of rows and that in order to have a uniquely determined position for each differently shaped marker, the differently shaped markers having relation to different rows have a different order and/or different configurations.

6. Method according to claim 1, characterized in that for each measuring element or marker its point of balance is detected and is used as a point representing the measured measuring element.

7. Method according to claim 3, characterized in that at least two rows of markers are provided on the tool, and that a line going through each row and/or the position of at least one measuring element point on each row are determined.

8. Method according to claim 7, characterized in that the rows of markers are parallel, the rows being either horizontal or vertical.

9. Method according to claim 7, characterized in that row of the tool is derived by combining the information regarding at least two of the rows.

10. Device for contactless or touch-free measurement of a tool by means of imaging area means and processing means making calculations based on image point on the tool, imaged onto the imaging area means, and optics presenting the image of the image points on the tool on the imaging area means, the processing means being adapted to calculate the momentary position

and/or orientation along at least one axis of the tool making use of the image points, characterized by a number of measuring elements and/or markers having predetermined mutual positions and being provided on the tool, each measuring element and/or marker comprising at least one measuring point, and at least one of them being identifiable; each measuring element and/or marker to be used as position and/or orientation indicating means having a size making it restorable by the processing means even if a part of it on the tool is obscured for the image area means.

11. Device according to claim 10, characterized in that least some of the measuring elements and/or markers, called lined measuring elements, are positioned on at least one row; and that for each row the processing means determines at least one 3D line going through the lined measuring elements for the row in question and/or the equation of at least one line going through the measuring element or markers provided in the same row.

12. Device according to claim 10, characterized in that there are at least two rows of measuring elements or markers; and that the processing means is adapted to make calculations of a line through each row and/or the position of at least one measuring element or marker on each row.

13. Device accordingly to claim 12, characterized in that the rows are parallel to each other, either horizontally or vertically.

14. Device according to claim 12, characterized in that the rows of markers extend along a line going from one end side of the tool to the other and are angled in relation to each other.

15. Device accordingly to claim 10, characterized in that the processing means is adapted to make consecutive measurements to the measuring elements, each measurement resulting in the calculation of at least a line of the tool surface in space, and the processing means is adapted to

calculate movements of the tool in space between calculations and thereby to calculate at least one type of movement of the tool, such as shift, or rotation.

16. Device according to claim 10, characterized in that at least most of the markers on the tool have the same shape, for instance circular, and that at least one marker is provided having a shape different from the others, clearly distinguishable in the imaging area(s), each said differently shaped marker having a predetermined known position on the tool and in relation to a predetermined constellation of the others.

17. Device according to claim 16, characterized in that most of the measuring elements are positioned in a plurality of rows, and that, in order to have a uniquely determinable position for each differently shaped marker, the markers having positions related to different rows have a different order and/or different configurations.

18. Device according to claim 10, characterized in that each measuring element provided in a row of measuring elements used for the measurement is a part of a marker having a two-dimensional shape.

19. Device according to claim 10, characterized in that the processing means detects the point of balance in a marker and uses it as one of the measuring points.

20. Device according to claim 10, characterized in that the processing means calculates shift of the tool by detecting different spatial positions of the differently shaped marker or markers in the consecutively made measurements.

21. Device according to claim 10, characterized in that the markers are reflective and provided on a dull background, and by lighting units illuminating the markers at least during the imaging of the imaging areas.